

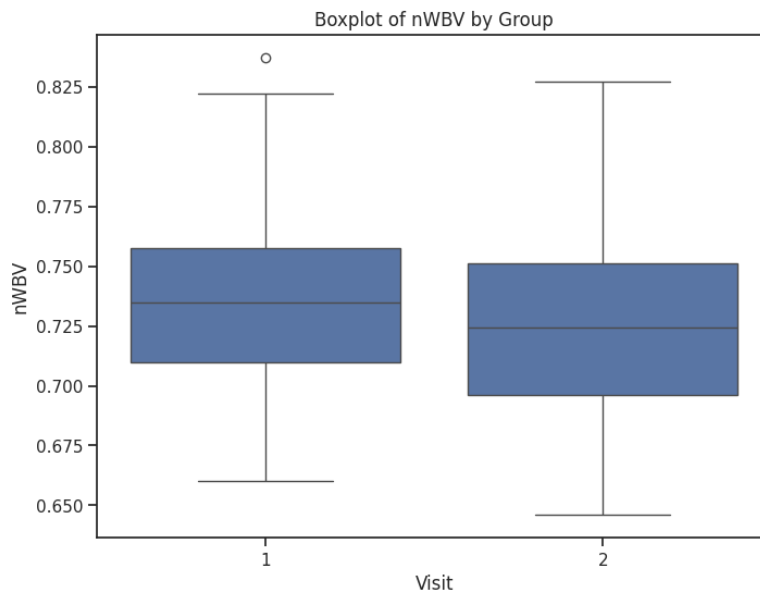
Exploring MRI results of patients with/without dementia

1. Introduction

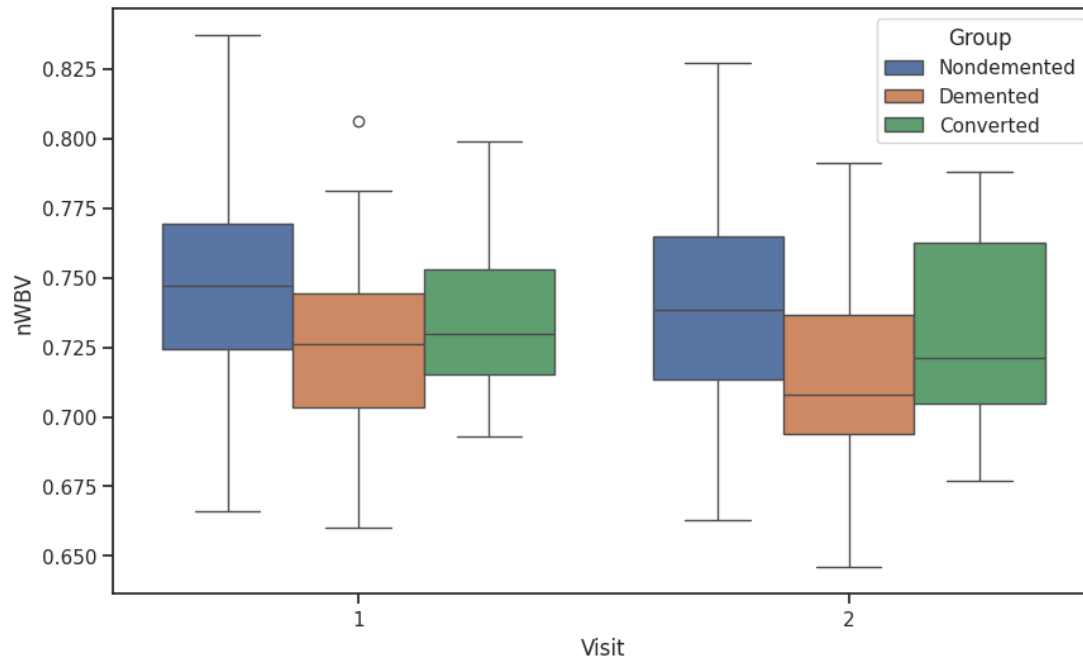
We are looking into the reading, math and general knowledge scores for fall 1998 and spring 1999 measurements, evaluating kindergarten students over the span of several months, based on the total house income.

1. **Research Question 1:** What are the Normalize Whole Brain Volume difference among nondemented, demented and converted patients?
2. **Research Question 2:** What are the Normalize Whole Brain Volume of nondemented, demented and converted patients change with time past?

2. Exploratory Data Analysis (EDA)

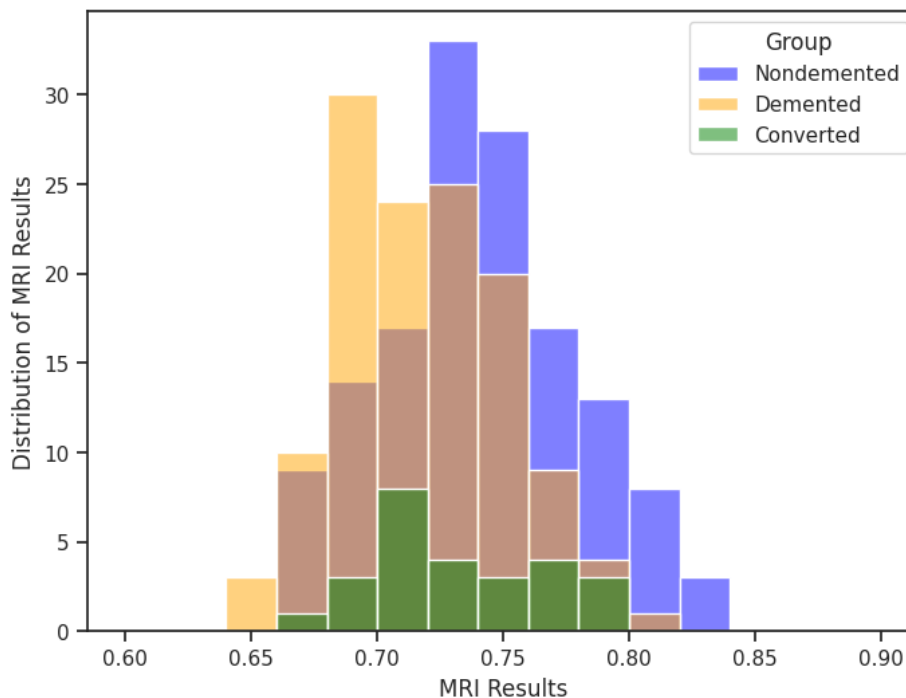


We begin by examining the structure and characteristics of our dataset, ensuring completeness and coherence. Understanding variables such as nWBV, group labels, and visit timestamps is essential for meaningful analysis.



We analyze the distribution of nWBV within each group, using histograms and summary statistics. This enables us to identify any disparities in brain volume among nondemented, demented, and converted patients.

Next, we investigate the relationship between nWBV and patient groups.



Base on the figure above we can see the Nondemented patients' nWBV are clearly better than Demented patients'

3. Mixed Anova

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ANOVA SUMMARY
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Source	SS	DF1	DF2	MS	F	p-unc	np2	eps
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Group	0.034	2	141	0.017	6.712	0.002	0.087	nan
Visit	0.007	1	141	0.007	94.251	0.000	0.401	1.000
Interaction	0.000	2	141	0.000	1.534	0.219	0.021	nan

Group: The p-value (p-unc) associated with the Group factor is 0.002, indicating that there is a statistically significant difference in Normalize Whole Brain Volume among the groups (nondemented, demented, and converted patients). The effect size (np2) is 0.087, suggesting a small-to-medium effect.

Visit: The p-value associated with the Visit factor is <0.001, indicating that there is a statistically significant difference in Normalize Whole Brain Volume across different visits. The effect size is relatively large (np2 = 0.401), indicating that the visit factor explains a substantial amount of the variability in Normalize Whole Brain Volume.

Interaction: The p-value associated with the interaction between Group and Visit is 0.219, which is not statistically significant ($p > 0.05$). This suggests that there is no significant interaction effect between Group and Visit on Normalize Whole Brain Volume.

4. Postdoc test

Comparison between visits:

There is a significant difference in Normalize Whole Brain Volume between Visit 1 and Visit 2, as indicated by the very low p-value (p-unc = 0.000) and a large effect size (BF10 = 2258000000000000.000).

Group comparisons:

Between Converted and Demented patients, there is no significant difference in Normalize Whole Brain Volume, as indicated by a non-significant p-value (p-unc = 0.182). Similarly, there is no significant difference in Normalize Whole Brain Volume between Converted and Nondemented patients (p-unc = 0.527).

However, there is a significant difference in Normalize Whole Brain Volume between Demented and Nondemented patients, with a very low p-value (p-unc = 0.000).

Interaction between Visit and Group):

For Visit 1, there are no significant differences in Normalize Whole Brain Volume between any pair of groups (Converted vs. Demented, Converted vs. Nondemented, and Demented vs. Nondemented).

For Visit 2, there are also no significant differences in Normalize Whole Brain Volume between any pair of groups.

5. Conclusion

Our analysis indicates a significant difference in nWBV among patient groups ($p\text{-unc} = 0.002$), with post hoc tests revealing specific differences. While no significant difference was observed between Converted and Demented patients ($p\text{-unc} = 0.182$), significant differences were found between Demented and Nondemented patients ($p\text{-unc} = 0.000$). These findings suggest distinct structural brain associated with/without dementia .

We observed a significant difference in nWBV between different visits ($p\text{-unc} < 0.001$), indicating temporal changes in brain volume. Post hoc tests revealed a significant difference between Visit 1 and Visit 2 ($p\text{-unc} = 0.000$), emphasizing the importance of considering disease progression over time in understanding brain changes associated with dementia.

In conclusion, our analysis of MRI data on patients with and without dementia reveals significant findings regarding Normalize Whole Brain Volume . We observed substantial differences in nWBV between patient groups and over different visits.